

REMARKS

Allowed Claims 4, 5, 9-11, 13 & 14

The allowance of claims 4, 5, 9-11, 13 and 14 is acknowledged with appreciation.

Allowable Claims 16, 18, 20, 27, 30, 31 & 37

The indication that each of claims 16, 18, 20, 27, 30, 31 and 37 would be allowed if rewritten in independent form is acknowledged with appreciation.

Each of claims 16, 27 and 37 has been rewritten in independent form including all of the limitations of their respective base claim and any intervening claims. Accordingly, claims 16, 27 and 37 are believed to now be in a proper form and condition for allowance and such action is requested.

Each of claims 18, 20, 30 and 31 is ultimately dependent on now independent claim 16 and hence are also allowable and such action is requested.

The Rejections

The remaining claims were rejected only under §103 in view of a combination of the Reef and Fournier references, or Rich, Fournier and Itatsu references.

Reef U.S. Patent 5,667,366

Reef discloses a fuel pump module for a return type fuel system in which a high pressure pump 14 supplies its entire output of high pressure fuel directly to an engine through a conduit 18. Excess fuel not consumed by the engine passes through a pressure regulator on the engine fuel rail and is returned at a low pressure and a varying flow rate or volume depending on the engine fuel

demand through a line 20 (Col 4) to a jet pump 10 which discharges this low pressure return fuel along with fuel 24 entrained from the fuel tank 12 into a reservoir 16 in which the high pressure pump 14 and its inlet is received. With this system, excess low pressure return fuel actuates the jet pump 10 and the jet pump delivers a minimum quantity of fuel and sometimes no fuel into the reservoir 16 during peak fuel demand of the engine which is precisely the time when the maximum quantity of fuel should be supplied to the relatively small reservoir 16 because it is being emptied at the maximum rate by the peak fuel demand of the engine.

As stated at Col 4, Line 64 to Col 5, Line 3, the return line maximum pressure will be 1.2 to 1.5 bars and the return fuel flow to the venturi to be as low as 20 liters/hr and as high as 180 liters/hr. In contrast, in applicants' system, the high pressure pump supplies fuel to the jet pump at a relatively constant pressure typically in the range of 4-5 bar and at a substantially constant and low flow rate typically in the range of about 20 to 30 liters/hr.

Contrary to the contention in the Office Action, Reef does not disclose any of the high pressure fuel output of the pump 14 being supplied to the jet pump 10 but rather low pressure fuel at a significantly varying flow rate of the unconsumed excess fuel discharged by the pressure regular downstream of the engine fuel injectors.

As acknowledged in the Office Action, Reef does not disclose any restrictor plate at all.

Fournier U.S. Patent 5,647,328

Fournier discloses a fuel pump module 10 with a high pressure electric fuel pump 14 with an outlet 20 through which it supplies high pressure fuel to an engine through a conduit 24. Both the high pressure fuel pump 14 and its inlet 16 are outside of a reservoir 26. The pressure of the high pressure fuel supplied to the engine is controlled, regulated and maintained substantially

constant by a pressure regulator 22 which discharges at a low pressure excess fuel (not consumed by the engine) through its outlet 28 into the canister 26 at substantially atmospheric pressure. The bottom of the reservoir has an orifice 90 sized so that the canister will be substantially completely filled with fuel discharged from the outlet 28 through the pressure regulator during normal operation of the pump with minimum overflow of fuel in the open top of the canister and back into the main fuel tank (Col 10, Lines 8-23). Fuel flowing from the orifice 28 enters the filter 18 and may flow to the inlet 16 of the operating high pressure pump. Fournier does not have any jet pump at all.

Contrary to the contention in the Office Action,

1. the pressure regulator bypass outlet 28 is not a nozzle if the English language means anything at all;
2. Fournier does not teach any jet pump at all or any jet pump nozzle supplying fuel to the reservoir;
3. Any high pressure fuel pump inlet 16 in the reservoir 26;
4. Any restrictor plate 30 between the outlet 20 of the high pressure fuel pump and the inlet of any nozzle, rather it simply discloses a restrictor plate 30 in the bottom of the reservoir through which flows into the filter 18, some of which may enter the inlet of the high pressure pump.

Rich U.S. Patent 5,070,849

Rich discloses a fuel pump module 10 with a high pressure electric fuel pump 22 received in a closed reservoir 20 and supplying high pressure fuel to both a vehicle engine and through tube 62 to a jet pump 38 which discharges fuel into the closed reservoir. In operation, the jet

pump entrains fuel from either the fuel tank 12 or when the reservoir is full recirculates fuel in the reservoir 20 through a valve housing 64, conduit 70 and an inlet 72 in the jet pump.

Contrary to the contention in the Office Action, Rich does not disclose, suggest or teach:

1. a high pressure fuel pump 38, but rather a high pressure pump 22 with an inlet 24 and an outlet 26;
2. an inlet of the high pressure pump from a hose 62, but rather high pressure pump 22 with an inlet 24; or
3. a return line 62, but rather line 62 supplies fuel to the jet pump to operate it.

As acknowledged in the Office Action, Rich does not disclose any restrictor plate or orifice at all.

Itatsu U.S. Patent 6,708,904

Itatsu discloses an internal combustion engine fuel injector 1 for atomizing liquid fuel with a discharge nozzle 5 having three plates 51, 52, 53, each with holes therein. Inlet plate 51 has two spaced-apart holes 51a each with an axis parallel to the nozzle axis L1, outlet plate 53 has two outlet holes 53a each with an axis inclined to the nozzle axis L1 and located radially inboard of the inlet holes 51a, and plate 52 has two elongate slots 52a communicating the inlet holes with the outlet holes. This configuration of holes provides extremely turbulent flow multiplying or increasing the atomization effect on the fuel flowing through the injector (Col 2, Line 58-65).

Rejection of Claims 1 and 35

In the current Office Action, independent claims 1 and 35 were rejected as being unpatentable under §103 over Reef in view of Fournier.

Amended Claim 1

As amended herein, claim 1 defines a fuel pump module having a high pressure pump with an outlet of high pressure fuel supplied to an engine, a jet pump having an inlet communicating with the fuel tank, an outlet supplying fuel to the reservoir and a jet nozzle with an inlet receiving high pressure fuel through a conduit from the high pressure fuel pump upstream of the engine, and at least one restrictor plate in a conduit between the high pressure fuel pump and the inlet of the nozzle with an orifice upstream of the nozzle restricting the flow of high pressure fuel in the high pressure fuel pump through the inlet of the jet nozzle.

Neither applicants' specific concept, construction and arrangement as defined by amended claim 1 nor its significant practical advantages are taught or made obvious to persons of ordinary skill in view of the proposed combination of the Reef and Fournier references.

Reef neither recognizes the problem solved by applicants' invention nor provides any solution to the problem of increasing the output and efficiency of a fuel pump module particularly under cold start and peak fuel demand engine operating conditions without increasing the maximum output capacity of the electric high pressure fuel pump of the module. Reef discloses a construction in which the jet pump is powered and operated by low pressure excess fuel (not consumed by the engine) returned to the fuel pump module downstream of the pressure regulator which has varying flow rates of low pressure fuel at varying low pressures with minimum pressure and flow rate during cold start and peak fuel demand conditions which are the very times at which maximum fuel flow discharged from the jet pump is desired. Furthermore, undisputedly, Reef does not have any supply of high pressure fuel from the output of the electric fuel pump to its jet pump, any orifice plate or restrictor orifice in any high pressure fuel supply to a jet pump,

nor any restrictor plate or restricted orifice at all in its supply of low pressure return fuel to its jet pump.

Likewise, Fournier neither recognizes, addresses nor provides any solution to the problem confronting applicants of increasing maximum flow of high pressure fuel to an engine particularly under cold start and peak demand conditions without increasing the maximum output capacity of the high pressure electric fuel pump. Fournier does not have any jet pump at all, any jet pump with a nozzle operated by part of the high pressure output flow from the high pressure fuel pump, nor any orifice or restrictor plate at all limiting and restricting the flow of fuel to operate any jet pump at all.

Accordingly, for at least these reasons, the Reef and Fournier references, whether considered alone or in combination do not disclose, suggest, teach or make obvious to one of ordinary skill in the art applicants' invention as defined by amended claim 1, the problem addressed and solved by applicants' invention nor its significant practical advantages, all of which must be considered in determining non-obviousness under §103. Indeed, for these reasons, these references teach away from applicants' construction as defined by amended claim 1 and its significant practical advantages and do not contain any suggestion, teaching or motivation that they should be combined. Furthermore, even if the teachings of these references were combined by a person of ordinary skill, they would simply result in a construction in which the jet pump is powered and operated by unburned low pressure fuel returned from the engine downstream of a pressure regulator and thereby having and indeed compounding the very problem addressed and solved by applicants' specific construction and arrangement as defined by amended claim 1.

For at least these same reasons, these references must have been selected and their combination proposed utilizing the teachings of applicants' invention which use of hindsight is impermissible and expressly precluded in applying the non-obviousness test of §103.

Accordingly, for at least these reasons, amended claim 1 defines patentable subject matter under §103(a) and should be allowed.

Dependent Claims 2, 3, 6, 7, 8

As originally filed or amended herein, each of claims 2, 3, 6-8 is ultimately dependent on amended claim 1 and hence defines patentable subject matter and should be allowed for at least the foregoing reasons.

Claim 35

Even though amended independent claim 35 is broader in some respects and narrower in others than amended claim 1, it is believed to define non-obvious subject matter under §103 and to be patentable over the proposed combination of the Reef and Fournier references for at least the foregoing reasons for which amended claim 1 does so. Accordingly, reconsideration and allowance of amended claim 35 is requested.

Dependent Claims 36 & 38

Each of claims 36 and 38 is ultimately dependent on independent claim 35 and it is believed for the above noted reasons for which claim 35 does so and should be allowed.

Rejection of Claims 15 & 32

In the current Office Action, independent claims 15 and 32 were rejected under §103 over the proposed combination of the Rich and Fournier references.

Independent Claim 15

As amended herein, independent claim 15 defines an arrangement for transferring fuel from one portion of the fuel tank to another spaced-apart portion of the tank which has a source having an outlet of high pressure fuel supplied to an engine and a fuel inlet in one portion of the tank, a jet pump having an inlet in another portion of the fuel tank, a nozzle disposed in one portion of the fuel tank with an inlet communicating with the source of high pressure fuel upstream of the engine, at least one restrictor plate having an orifice communicating through a conduit with the source of high pressure fuel, disposed between the source upstream of the engine and the inlet of the nozzle and axially spaced upstream from the inlet of the nozzle to restrict the flow of high pressure fuel to the nozzle, and a venturi having an inlet in communication with another portion of the fuel tank and with the outlet of the nozzle to receive fuel discharged from the nozzle, and an outlet through which fuel is discharged from the venturi with the flow of fuel from the nozzle to the venturi causing fuel to move from the another portion of the fuel tank into the inlet of the venturi.

Amended Claim 15 is Patentable

As amended, claim 15 defines patentable subject matter under §103 over the proposed combination of the Rich and Fournier references, which do not disclose, suggest or teach to

skilled persons the problem confronting applicants, their construction as defined by amended claim 15 nor its significant practical advantages for at least the following reasons.

Neither Rich nor Fournier disclose, suggest or make obvious to skilled persons the problem confronting applicants of increasing the maximum rate of delivery of high pressure fuel to an engine particularly under cold start and peak fuel demand engine operating conditions and increased efficiency without increasing the maximum flow rate output of the high pressure fuel source. Rich teaches away from applicants' invention by disclosing a construction having the very problem solved by applicants and by disclosing a construction in which there is no restrictor plate or orifice at all limiting fuel flow to the jet pump and no such restrictor plate and orifice between the high pressure source and the nozzle of the jet pump.

As indicated above, Fournier does not disclose or teach the problem confronting applicants, any solution of this problem, any jet pump at all, any jet pump powered and operated by a source of high pressure fuel, nor any restrictor plate or orifice restricting the flow rate of fuel to the inlet of the nozzle of any jet pump.

Accordingly, for at least these reasons, the proposed combination of Rich and Fournier does not disclose, suggest or teach to skilled persons applicants' invention as defined by amended independent claim 15. Furthermore, neither of these references nor the skill of the art provide any disclosure, suggestion, teaching, reason or motivation to combine these references. These references, whether considered alone or in combination, do not disclose, suggest or teach to skilled persons the problem confronting applicants, applicants' construction and arrangement solving this problem as defined by amended claim 15 nor its significant practical advantages, all of which must be considered in determining patentability under §103.

For these reasons, these references must have been selected and their combination proposed utilizing the teachings of applicants' invention which use of hindsight is impermissible and expressly precluded in applying the non-obvious test of §103. Accordingly, for at least these reasons, amended claim 15 defines patentable subject matter under §103 over the Rich and Fournier references whether considered alone or in combination with the other references of record and should be allowed.

Dependent Claims 17, 19, 21, 23, 25, 26, 28 & 29

Each of claims 17, 19, 21, 23, 25, 26, 28 and 29 is ultimately dependent on amended claim 15 and hence defines novel and patentable subject matter for at least the reasons for which claim 15 does so and should be allowed.

Independent Claim 32

As amended, independent claim 32 is broader in some respects and narrower than others than claim 15 but nevertheless is believed to define patentable subject matter under §103 for at least essentially the foregoing reasons for which claim 15 does so. Reconsideration and allowance of amended independent claim 32 is requested.

Independent Claim 35

As amended, independent claim 35 is broader in some respects and narrower in others than claim 32 and calls for a pair of orifices communicating with a source of high pressure fuel. Claim 32 is believed to define patentable subject matter under §103 for at least the foregoing reasons for which claim 32 does so and should be allowed.

Dependent Claim 39

Claim 39 is directly dependent on claim 32 and hence defines patentable subject matter for at least the reasons for which claim 32 does so and should be allowed.

Conclusion

The allowance of claims 4, 5, 9-11, 13, 14 and the indication that claims 16, 18, 20, 27, 30, 31, 37 would be allowable if rewritten in independent form is acknowledged with appreciation. Claims 16, 27 and 37 have been rewritten in independent form, claims 18 and 20 are dependent on claim 16, and claims 30 and 31 are dependent on claim 27, and accordingly these claims are believed to be in a proper form and condition for allowance and such action is requested.

As amended herein, independent claims 1, 15, 32, and 35 are believed to define patentable subject matter under §103 and reconsideration and allowance thereof is requested. Since claims 2, 3, 6, 7 and 8 are dependent on independent claim 1, claims 17, 19, 21, 23, 25, 26, 28 and 29 are dependent on independent claim 15, claim 29 is dependent on independent claim 32, and claims 36-38 are dependent on independent 35, these claims also define patentable subject matter and should be allowed.

Since these amendments have reduced the total number of independent claims and the total number of the remaining claims, it is believed no additional claims fees are due. However, if the calculations of the USPTO indicates otherwise, please charge any additional claim fees to our Deposit Account No. 50-0852.

If after considering this Response the Examiner is of the view that any of the claims are not allowable, a telephone interview with applicants' undersigned attorney William Francis is requested so that immediate consideration can be given to any further amendments proposed by the Examiner or otherwise needed to place all the claims in a condition for allowance. The Examiner is asked to initiate this interview by telephoning William Francis at 248-689-3500, Ext 153, who normally can be reached Monday through Friday between 9 a.m. and 5 p.m.

Respectfully submitted,

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WHF:sal

By



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